

# NAG Fortran Library Routine Document

## A02ABF

**Note:** before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

### 1 Purpose

A02ABF returns the value of the modulus of the complex number  $x = (x_r, x_i)$ .

### 2 Specification

```
real FUNCTION A02ABF(XR, XI)
real                XR, XI
```

### 3 Description

The function evaluates  $\sqrt{x_r^2 + x_i^2}$  by using  $a\sqrt{1 + (\frac{b}{a})^2}$  where  $a$  is the larger of  $x_r$  and  $x_i$ , and  $b$  is the smaller of  $x_r$  and  $x_i$ . This ensures against unnecessary overflow and loss of accuracy when calculating  $(x_r^2 + x_i^2)$ .

### 4 References

Wilkinson J H and Reinsch C (1971) *Handbook for Automatic Computation II, Linear Algebra* Springer-Verlag

### 5 Parameters

1:	XR – <i>real</i>	<i>Input</i>
2:	XI – <i>real</i>	<i>Input</i>

*On entry:*  $x_r$  and  $x_i$ , the real and imaginary parts of  $x$ , respectively.

### 6 Error Indicators and Warnings

None.

### 7 Accuracy

The result should be correct to *machine precision*.

### 8 Further Comments

None.

### 9 Example

To find the modulus of  $-1.7 + 2.6i$ .

## 9.1 Program Text

**Note:** the listing of the example program presented below uses *bold italicised* terms to denote precision-dependent details. Please read the Users' Note for your implementation to check the interpretation of these terms. As explained in the Essential Introduction to this manual, the results produced may not be identical for all implementations.

```
*      A02ABF Example Program Text
*      Mark 14 Revised.  NAG Copyright 1989.
*      .. Parameters ..
INTEGER          NIN, NOUT
PARAMETER       (NIN=5,NOUT=6)
*      .. Local Scalars ..
real           XI, XR, Y
*      .. External Functions ..
real           A02ABF
EXTERNAL        A02ABF
*      .. Executable Statements ..
WRITE (NOUT,*) 'A02ABF Example Program Results'
*      Skip heading in data file
READ (NIN,*)
READ (NIN,*) XR, XI
Y = A02ABF(XR,XI)
WRITE (NOUT,*)
WRITE (NOUT,*) '   XR   XI       Y'
WRITE (NOUT,99999) XR, XI, Y
STOP
*
99999 FORMAT (1X,2F6.1,F9.4)
END
```

## 9.2 Program Data

```
A02ABF Example Program Data
-1.7 2.6
```

## 9.3 Program Results

```
A02ABF Example Program Results
```

```
   XR   XI       Y
-1.7   2.6   3.1064
```

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